

1. (Currently Amended and Previously Presented and Twice Amended)

A method for communicating a data stream, the method comprising the steps of,

- generating a sequence of data symbols from the data stream,
- precoding the sequence of data symbols into a sequence of precoded data symbols,
- modulating the sequence of precoded data symbols into a continuous phase modulated signal,
- transmitting the continuous phase modulated signal,
- receiving the continuous phase modulated signal, and
- filtering the continuous phase modulated signal into a sequence of filtered signals having absolute phase for indicating the sequence of data symbols, wherein,

the generating step comprises the steps of receiving the data stream of data bits, formatting the data stream into the sequence of formatted data pulses as a sequence of data symbols within an M-ary symbol set,

the modulating step comprises the steps of Gaussian filtering and frequency modulating for generating the continuous phase modulated signal, the Gaussian filter step filters the precoded sequence of data symbols into pulse responses continuously accumulated over a finite memory time as a filter response, the Gaussian filtering step is defined by a bandwidth time product inversely defining the finite memory time, the frequency modulating step frequency modulates a carrier reference by the filter response by a modulation index for converting the filter response into the continuous phase modulated signal,

1        the continuous phase modulated signal is up converted from  
2 baseband during the transmitting step and is down converted to  
3 baseband during the receiving step using a local carrier, and  
4        the filtering step is a matched filtering step for matched  
5 filtering of the received continuous phase modulated signal into  
6 the filtered signal, the matched filtering is matched by pulse  
7 amplitude modulation representation to the Gaussian filtering step,  
8 the filtered signal has an absolute phase at a periodic sampling  
9 time for indicating the sequence of data symbols.

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11        2.        (Previously Presented and Once Amended ) The method of claim 1  
12 further comprising the steps of,

13                sampling the sequence of filtered signals into a sequence of  
14 sampled symbols, and

15                demodulating the sequence of sampled symbols into an estimated  
16 data stream.

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19        3. (Currently Canceled)

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22        4. (Currently Amended, Previously Presented and Thrice Amended) The  
23 method of claim 3 1 wherein,

24                the modulation index is equal to a fraction selected from a  
25 group consisting of  $1/M$  and  $(1-1/M)$  fractions for the M-ary symbol  
26 set where  $M=2^k$  and k is an integer.

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1 5. (Previously Presented and Twice Amended) A method for  
2 communicating a data stream, the method comprising the steps of,  
3 generating a sequence of data symbols from the data stream by  
4 formatting the data stream into the sequence of formatted data  
5 pulses as a sequence of data symbols within a 2-ary symbol set,  
6 precoding the sequence of data symbols into a sequence of  
7 precoded data symbols,

8 Gaussian filtering the precoded sequence of data symbols into  
9 pulse responses continuously accumulated over a finite memory time  
10 as a filter response, the Gaussian filtering is defined by a  
11 bandwidth time product inversely defining the finite memory time,  
12 frequency modulating a carrier reference by the filter  
13 response by a modulation index for converting the filter response  
14 into a continuous phase modulated signal, and

15 matched filtering the received continuous phase modulation  
16 signal into a filtered signal, the matched filtering is matched by  
17 pulse amplitude modulation representation to the Gaussian  
18 filtering, the filtered signal has an absolute phase at a periodic  
19 sampling time for indicating the sequence of data symbols.

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21 6. (Previously Presented and Amended) The method of claim 5,  
22 wherein,

23 the sequence of data symbols has a data symbol  $d_n$  at a current  
24 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
25 immediate previous symbol time  $n-1$  for precoding the data sequence  
26 into the sequence precoded data symbols having a precoded data  
27 symbol  $\alpha_n$  at the current symbol time, the precoding step is defined  
28 by  $\alpha_n = [d_n - d_{n-1} + 1]_{\text{mod}4}$ .

1 7. ( Previously Presented and Once Amended) The method of claim 5,  
2 wherein,

3 the sequence of data symbols has a data symbol  $d_n$  at a current  
4 symbol time  $n$  where  $n$  is an integer and has a data symbol  $d_{n-1}$  at an  
5 immediate previous symbol time  $n-1$  for precoding the data sequence  
6 into the sequence of precoded data symbols having a precoded data  
7 symbol  $\alpha_n$  at the current symbol time for even symbol times and for  
8 odd symbol times, the precoding step is defined by  $\alpha_n = [d_n - d_{n-1}$   
9  $+ 1]_{\text{mod}4}$  for even symbol times and  $\alpha_n = -[d_n - d_{n-1} + 1]_{\text{mod}4}$  for  
10 odd symbol times.

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13 8. (Previously Presented and Original) The method of claim 5  
14 wherein the modulation index is  $1/2$ .

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18 9. (Previously Presented and Original) The method of claim 5  
19 wherein the bandwidth time product is  $1/3$ .

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23 10. (Previously Presented and Original) The method of claim 5  
24 wherein the filtering step is a matched filtering step for applying  
25 a principal Laurent function to the baseband signal so that the  
26 filtered signal comprises a principal Laurent component.

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11. (Previously Presented and Twice Amended) A method for communicating a data stream, the method comprising the steps of, generating a sequence of data symbols from the data stream by formatting the data stream into the sequence of formatted data pulses as a sequence of data symbols within a 4-ary symbol set, precoding the sequence of data symbols into a sequence of precoded data symbols, Gaussian filtering the precoded sequence of data symbols into pulse responses continuously accumulated over a finite memory time as a filter response, the Gaussian filtering is defined by a bandwidth time product inversely defining the finite memory time, frequency modulating a carrier reference by the filter response by a modulation index for converting the filter response into a continuous phase modulated signal, matched filtering the continuous phase modulated signal into a filtered signal, the matched filtering is matched by pulse amplitude modulation representation to the Gaussian filtering, the filtered signal has an absolute phase at a periodic sampling time for indicating the sequence of data symbols, and demodulating the sequence of data symbols into an estimate of the data stream.

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1 12. (Previously Presented and Original) The method of claim 11,  
2 wherein,

3 the sequence of data symbols has a data symbol  $d_n$  at a current  
4 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
5 symbol time  $n-1$  for precoding the data sequence into the sequence  
6 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
7 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
8  $d_{n-1} + 1]_{\text{mod}8}$ .

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11 13. (Previously Presented and Original) The method of claim 12  
12 wherein the precoded data symbol  $\alpha_n$  is defined by the 4-ary symbol  
13 set of +1, -1, +3 and -3.

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16 14. (Previously Presented and Original) The method of claim 12  
17 wherein the modulation index is 1/4.

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20 15. (Previously Presented and Original) The method of claim 11,  
21 wherein,

22 the sequence of data symbols has a data symbol  $d_n$  at a current  
23 symbol time  $n$  and has a data symbol  $d_{n-1}$  at an immediate previous  
24 symbol time  $n-1$  for precoding the data sequence into the sequence  
25 precoded data symbols having a precoded data symbol  $\alpha_n$  at the  
26 current symbol time, the precoding step is defined by  $\alpha_n = [d_n -$   
27  $d_{n-1} + 3]_{\text{mod}8}$ .

1 16. (Previously Presented and Original) The method of claim 15  
2 wherein the precoded data symbol  $\alpha_n$  is defined by the 4-ary symbol  
3 set of +1, -1, +3 and -3.

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5 17. (Previously Presented and Original) The method of claim 15  
6 wherein the modulation index is 1/4.

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8 18. (Previously Presented and Amended) The method of claim 11  
9 wherein the filtering step is a matched filtering step for applying  
10 a principal Laurent function, a third Laurent function and a  
11 twelfth Laurent function to the baseband signal so that the  
12 filtered signal comprises a principal Laurent component, a third  
13 Laurent component and a twelfth Laurent component.

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15 19. (Previously presented and original) The method of claim 11  
16 wherein the modulation index is 3/4.

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18 20. (Previously presented and original) The method of claim 11  
19 wherein the bandwidth time product is 1/3.

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